

The JRC and the Arctic

*How JRC science can underpin the
successful implementation of an EU
Arctic Policy*

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Abstract

The Arctic is experiencing unprecedented and disproportionately high rates of environmental change due to effects of climate change. These changing conditions are making it easier to exploit the natural wealth of the Arctic (mineral, fisheries, land) while putting the existence of Arctic ecosystems and the indigenous population that rely on them under threat. EU institutions have recognised these opportunities for, and threats to, the Arctic. The EU Commission and the EEAS (European External Action Service) are due to “present proposals for the further development of an integrated and coherent Arctic Policy” in the first quarter of 2016. A cornerstone of EU efforts is engagement with the Arctic Council, the high-level intergovernmental forum of States bordering the Arctic, representatives of indigenous peoples, and permanent observers (including seven EU Member States). The Arctic Council has not yet pronounced on the EU’s longstanding application for observer status, and will not do so before 2017. By virtue of its scientific excellence, JRC engagement with the Arctic Council and its subsidiary bodies is therefore currently one of the few **channels for direct engagement of the EU with the Arctic Council**. This report presents JRC activities in support of the Arctic Council and its bodies, and possibilities for their further development, identifying three alternative paths for future engagement in support of EU Arctic policy making.

1. Introduction

While experiencing unprecedented environmental change due to the disproportionately large local effects of climate change (including enhanced access to the area and the creation of new possibilities for maritime transportation via the Arctic Seas), the Arctic region is increasingly becoming the focus of attention due to the enormous quantities of natural resources it holds.

In 2014, the European Parliament called for the involvement of the EU in the Arctic, and the EU Council defined the main directions for the EU's contribution. Although the EU Council strongly supported the efforts of the European External Action Service (EEAS) and the Commission in working towards making the EU a permanent observer in the Arctic Council, a high-level intergovernmental forum on the Arctic cooperation, a decision has been deferred until 2017 at the earliest. Thus, at present the EU may only be a guest at Arctic Council proceedings, their working groups and other subsidiary bodies.

Through scientific cooperation and expertise inside Arctic Council subsidiary bodies, the JRC is in a unique position to contribute to the Commission's priorities of becoming "A Stronger Global Actor" and fostering "A Union of Democratic Change", by strengthening the links between EU institutions and the Arctic Council and contributing to the development of an EU policy on the Arctic. The Arctic is also relevant to the Commission priorities of promoting "A Resilient Energy Union with a Forward-Looking Energy Policy" and "A New Boost for Jobs, Growth and Investment".

This document gives an overview of EU policy on the Arctic, the Arctic Council and the on-going and possible future JRC contributions to the Arctic Council working groups. It further discusses the possible evolution of the JRC's contribution in the future.

2. Policy Context

2.1 Parliament and Council positions regarding EU policy on the Arctic

Following the Joint Communication of the Commission and the High Representative in June 2012 on Developing a European Union Policy towards the Arctic Region¹, the future EU strategy regarding the Arctic was debated in the European Parliament. The resulting resolution of 12 March 2014 on the EU strategy for the Arctic² calls for initiatives to support, inter alia, blue growth in the Arctic and to strengthen the links with science and business in order to support the Arctic's sustainable economic development. In response to the Parliament resolution, the EU Foreign Affairs Council adopted conclusions on developing an EU policy on the Arctic in May 2014 that further set the main directions for the next steps in EU policy development for the region, and call on the Commission and the High Representative to "present proposals for the further development of an integrated and coherent Arctic Policy by December 2015"³.

The conclusions of the EU Foreign Affairs Council stress that climate change is inducing fundamental changes in the Arctic which, together with the prospect of increasing economic development, may well challenge the sustainable development of the region. The EU Foreign Affairs Council further supports the view that EU action should be strengthened by supporting research and improving knowledge, and by strengthening the support for the protection of the Arctic environment through the use of policies on, for example, climate change, air pollution, biodiversity and fisheries. Finally, the Council reaffirms that the Arctic Council is the primary body for circumpolar regional cooperation.

The Arctic Council is a high-level intergovernmental forum that provides a means for promoting cooperation, coordination and interaction among the Arctic States on common Arctic issues, in particular issues of sustainable development and environmental protection in the Arctic. Cooperation in these areas and coordination with states outside the Arctic is also encouraged. On behalf of the EU, the Commission applied to become a permanent observer in the Arctic Council in December 2008, and revised the application in December 2011, following the adoption of criteria for the admission of observers by the Arctic Council. The EU Foreign Affairs Council strongly supports the efforts of the European External Action Service (EEAS) and the Commission in working towards making the EU a permanent observer in the Arctic Council as soon as possible. In anticipation of receiving permanent observer status, there is a strong EU commitment to actively contribute to activities of the Arctic Council and its working groups, wherever possible.

2.2 The Arctic Council

The 1996 Ottawa Declaration formally established the Arctic Council as a high-level intergovernmental forum. The current Members of the Arctic Council are Canada, Denmark (including Greenland and the Faroe Islands), Finland, Iceland, Norway, the

¹ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=JOIN:2012:0019:FIN:EN:PDF>

² <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+MOTION+P7-RC-2014-0229+0+DOC+PDF+V0//EN>

³ http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/EN/foraff/142554.pdf

Russian Federation, Sweden, and the United States of America. In addition to the Member States, the Arctic Council has Permanent Participants that represent the indigenous peoples of the region. They are the Arctic Athabaskan Council, the Aleut International Association, the Gwich'in Council International, the Inuit Circumpolar Council, the Russian Association of Indigenous Peoples of the North and the Saami Council.

Non-Arctic states, intergovernmental and inter-parliamentary organisations and non-governmental organisations may apply for observer status. Twelve non-Arctic countries (including EU Member States France, Germany, the Netherlands, Poland, Spain, the United Kingdom and Italy), nine intergovernmental organisations and eleven non-governmental organisations are observers in the Arctic Council.

The purpose of the Arctic Council is to promote cooperation, coordination and interaction among the Arctic States, with the involvement of the Arctic indigenous communities and other Arctic inhabitants in common Arctic issues, in particular issues regarding sustainable development and environmental protection in the Arctic. These tasks are carried out by a number of subsidiary bodies of the Council under the direction of Senior Arctic Officials.

The Arctic Council is currently chaired by the US for the period 2015-2017 in the person of the US Secretary of State John Kerry, following the chairmanship of the Council by Canada from 2013 -2015. US priorities for their chairmanship are threefold:

- Addressing the Impacts of Climate Change in the Arctic; incl. work on black carbon and methane emissions, developing a pan-Arctic digital evaluation map, and creating an early warning indicator system for a single pan-Arctic network;
- Stewardship of the Arctic Ocean, with a Regional Seas Programme (RSP) as a vehicle to improve Arctic ocean management, information sharing on pollutants, and the organisation of a Search and Rescue exercise in 2016; and
- Improving Economic and Living Conditions, including projects on renewable energy, public health, and freshwater security.

More generally, a public outreach campaign on the strategic importance of the Arctic and climate change impacts will be launched during the US Chairmanship. Following the adoption of the International Maritime Organization (IMO)'s Polar Code in 2014, the US would like to see the development of Phase II of the Polar Code, which would, inter alia, consider regulations for ships that do not comply with the International Convention for the Safety of Life at Sea (SOLAS).

In the near future we may expect a significant change in environmental conditions in the Arctic due to global climate change, which will allow for easier exploitation of the Arctic's gas, oil and mineral deposits. As a result, human pressure on the Arctic environment will be further significantly increased. Participation in Arctic Council bodies for implementing key EU policy objectives in the region will, therefore, become even more important than at present.

2.3 Subsidiary Bodies of the Arctic Council

The six working groups of the Arctic Council are the primary bodies that carry out the activities of the Council. Each working group has a mandate from the Arctic Council, a chair, and a management board, and is supported by a secretariat. Working groups are composed of experts from the relevant sectoral ministries, government agencies and researchers. The management board is composed of representatives of the Arctic Council's Member States.

Observer states and observer organisations may attend working group meetings, and participate in specific projects and their associated task forces or expert groups. Guests

and experts are regularly invited to working group, task force and expert group meetings.

2.3.1 Arctic Contaminants Action Program (ACAP)

ACAP acts as a strengthening and supporting mechanism to encourage national actions to reduce emissions and other releases of pollutants. Cooperative actions make a contribution to the overall international effort to reduce environmental damage on a global level.

2.3.2 Arctic Monitoring and Assessment Programme (AMAP)

AMAP provides reliable and sufficient information on the status of, and threats to, the Arctic environment, and scientific advice on actions to be taken in order to support Arctic governments in their efforts to take remedial and preventive actions relating to contaminants and the adverse effects of climate change.

2.3.3 Conservation of Arctic Flora and Fauna (CAFF)

CAFF serves as a vehicle to cooperate on species and habitat management and utilisation, to share information on management techniques and regulatory regimes, and to facilitate more knowledgeable decision-making. It provides a mechanism to develop common responses on issues of importance for the Arctic ecosystem, such as development and economic pressures, conservation opportunities and political commitments.

2.3.4 Emergency Prevention, Preparedness and Response (EPPR)

EPPR contributes to the protection of the Arctic environment from the threat or impact that may result from an accidental release of pollutants or radionuclides. In addition, EPPR considers questions related to the consequences of natural disasters.

2.3.5 Protection of the Arctic Marine Environment (PAME)

PAME combines activities related to the protection and sustainable use of the Arctic marine environment. It has a specific mandate to monitor the adequacy of relevant global and regional legal, policy and other measures, and where necessary to make recommendations for improvements.

2.3.6 Sustainable Development Working Group (SDWG)

The SDWG proposes and adopts steps to be taken by the Arctic States to advance sustainable development in the Arctic, including opportunities to protect and enhance the environment and the economies, culture and health of indigenous peoples and Arctic communities, as well as to improve the environmental, economic and social conditions of Arctic communities as a whole.

Additionally the Arctic Council may establish task forces or expert groups to carry out specific tasks. The Canadian Chairmanship (2013 -2015) established four task forces:

- Task force for action on black carbon and methane;
- Task force to facilitate the creation of a circumpolar business forum;
- Task force for enhancing scientific cooperation in the Arctic;
- Task force on Arctic marine oil pollution prevention.

2.4 Other organisations and initiatives

Besides the Arctic Council, there are other organisations dealing with Arctic issues whose activities feed into the work of the abovementioned subsidiary bodies of the Arctic

Council. The JRC already interacts with some of these bodies, or might do so in the future, providing opportunities to demonstrate that the JRC could bring added value through stronger EU engagement with the Arctic Council. In this context, two bodies are worth mentioning:

1. The International Council for the Exploration of the Sea (ICES), which declared Arctic research a priority area⁴. The JRC is an active member in a number of ICES expert working groups and collaborates with the ICES in providing scientific advice to the Common Fisheries Policy. In addition, the ICES contributes to the Transatlantic Alliance under the Galway Statement.

2. The European Polar Board (EPB), which is an independent European organisation of directors and managers of the major European national polar programmes. It was established in 1995 by the European Science Foundation as a strategic advisory body on Polar Science, and coordinates European Arctic and Antarctic research, optimises the use of European research infrastructures, fosters multilateral collaboration between European national funding agencies, national polar institutes and research organisations, and represents polar issues within European research framework programmes.

Furthermore, under the remit of the Galway Statement on Atlantic Ocean Cooperation and in the context of the Transatlantic Alliance, 'Tri-Partite Galway Arctic Governance' is envisioned involving the EU, Canada and the US. In this context, the JRC already contributes to the Canada-EU-US Working Group on Aquaculture, although this is under the maritime rather than the Arctic working group.

2.5 EU institutions and the Arctic

2.5.1 EEAS

The EEAS leads the EU efforts in preparing an Arctic Policy, with additional contributions from DGs (particularly MARE, REGIO and RTD). As climate change and economic development accelerate in the Arctic region, the European Union intends to step up its engagement with its Arctic partners to jointly meet the challenge of ensuring that development takes place sustainably, while safeguarding the environment. The European Commission and the High Representative propose that the further development of EU Arctic policy focus on three key areas⁵:

- supporting research and channelling **knowledge** to address environmental and climate change in the Arctic;
- acting **responsibly** to help ensure that economic development in the Arctic is based on sustainable use of resources and environmental expertise;
- stepping up constructive **engagement** and dialogue with Arctic states, indigenous peoples and other partners.

2.5.2 DG MARE

On behalf of the European Commission, DG MARE is responsible for the Arctic Ocean policy⁶. In order to ensure the Arctic region's sustainable development while safeguarding its fragile environment, DG MARE emphasises the role of research, e.g. stressing that commercial fisheries on the Arctic's high seas should not begin before a science-based and precautionary management regime exists.

⁴ <http://www.ices.dk/explore-us/Action%20Areas/Pages/Arctic.aspx>

⁵ http://www.eeas.europa.eu/arctic_region/

⁶ http://ec.europa.eu/maritimeaffairs/policy/sea_basins/arctic_ocean/index_en.htm

In line with this approach, DG MARE launched a public consultation in 2014 on “Streamlining EU funding in the Arctic”⁷ in order to:

- obtain an overview of the key investment and research priorities for the region;
- see if there is scope for further coordination and exchange of best practices;
- see where improvements could be made to the scale and scope of EU funding in specific areas such as connectivity, environment and development;
- consider how other sources of funding, for example from the private sector, could best be used to support regional economic development.

2.5.3 DG REGIO

DG REGIO has operated a European Regional Development Fund (ERDF) programme addressing the Northern Periphery of the EU since 2007. In the first programme (2007-2013) the priorities were:

- The promotion of innovation and competitiveness in remote and peripheral areas;
- Sustainable development of natural and community resources.

The countries covered were the EU Member States Finland, Sweden, the United Kingdom and Ireland, and partner countries Iceland, Norway, the Faroe Islands and Greenland. The current Northern Periphery and Arctic Programme (2014-2020) has a total budget of approximately €56 million (supported by the ERDF & ERDF equivalent funding from non-EU partner countries), and addresses four priority axes:

- Using Innovation to Maintain and Develop Robust and Competitive Communities;
- Promoting Entrepreneurship to Realise the Potential of the Programme Area’s Competitive Advantage;
- Fostering Energy-Secure Communities through the Promotion of Renewable Energy and Energy Efficiency;
- Protecting, Promoting and Developing Cultural and Natural Heritage.

2.5.4 DG RTD

DG RTD leads both the EU-US Science and Technology Joint Consultative Group’s Arctic Working Group and the EU-Canada Joint Science and Technology Coordination Committee Arctic Working Group, both of which look at trilateral coordination of research programming. The JRC participates in both.

DG RTD manages an active FP7 programme that addresses the Arctic.. Horizon 2020 (H2020) will see Arctic-themed calls for research in the fields of Food security, Agriculture and Forestry, Climate and Environment, and Transport and Leadership in Space. The recently started H2020 coordinating action, EU-PolarNet, aims to improve coordination between EU polar research institutions, and will develop an integrated EU Polar research programme, and create and sustain ongoing dialogue and cooperation with polar stakeholders.

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http://ec.europa.eu/dgs/maritimeaffairs_fisheries/consultations/arctic-eu-funding/doc/consultation-paper_en.pdf

3. JRC involvement with the subsidiary bodies of the Arctic Council

3.1 Current Status

The JRC has been working on issues related to the Arctic, representing the EU at meetings of the subsidiary bodies for several years. It could strengthen its pivotal role with respect to the engagement of the EU in the Arctic by providing scientific support for the political decision-making process.

3.1.1 Atmospheric monitoring and modelling of Black Carbon

The JRC has represented the EU in the Task Force for action on Black Carbon and Methane (TFBCM), acting also as the point of contact for DG ENV. The objective of this Task Force was to prepare a Framework for Action on enhanced black carbon and methane reductions in the Arctic, for the Arctic Council ministerial meeting of April 2015.

3.1.2 Arctic region forestry and biomass

The JRC was invited to present research on Arctic vegetation change and positive feedbacks with Climate Change at the Arctic Biodiversity Congress, which was arranged by the CAFF Working Group in Trondheim, Norway, in December 2014.

3.1.3 Sustainable Development Working Group

The JRC attended the Arctic Council SDWG meeting in Yellowknife, Canada, 22-24 April 2013.

3.1.4 Climate information, modelling and analysis

In April 2015, the JRC participated in the AMAP project meeting on Adaptation Actions for a Changing Arctic phase C (AACA-C) in Helsinki, Finland, and will contribute to the review of the final report of the project. The project will assess the current environmental status of the Arctic in relation to on-going socioeconomic changes.

3.1.5 Soil Atlas of Northern Circumpolar Region

As a contribution to the International Polar Year 2007-2008, the JRC coordinated a collaborative project with all Arctic countries to prepare the first ever, harmonised assessment of soil conditions in the region. Copies of the atlas were presented to the Arctic Council in 2010.

3.2 Additional areas in which the JRC could collaborate with the subsidiary bodies of the Arctic Council

The following section summarises the results of multilateral discussions between relevant JRC units and Lars-Otto Reiersen, Executive Secretary of the AMAP secretariat during a visit to Ispra on 22-23 June 2015. Other activities may be of interest to other subsidiary bodies of the Arctic Council.

3.2.1 Climate change impacts in the Arctic

Terrestrial

As an active participant in international research teams collating and analysing data from circumpolar ecosystem monitoring networks and satellites, the JRC monitors and analyses changes in Arctic vegetation, and how they relate to climate change. The JRC has developed an approach for efficient land cover classification and forest monitoring. High-resolution satellite imagery (Landsat) is used to estimate forest cover changes for

the period 1990-2000-2010. The JRC also assesses the recent and future impacts of the accelerated warming of the Arctic and boreal regions on primary productivity by integrating Earth Observation and ecosystem modelling activities, within the framework of the FP7 ICE-ARC project. The effects of climate warming on the land-atmosphere exchanges of the two major greenhouse gases (carbon dioxide and methane) are quantified using atmospheric measurements and modelling in these ecosystems.

Ecosystem-based assessment and management of the Arctic environment is very important for AMAP, and is also a subject of joint interest to both AMAP and CAFF. It is predicted that there will be a migration trend towards the north, with forests displacing the permafrost, elk displacing reindeer, and indigenous people being threatened by the arrival of new people who will come to exploit the forest.

The JRC Soil Atlas of Northern Circumpolar Region is an important reference tool for assessments. It presents a baseline for seasonally frozen and permafrost-affected soils, together with soil organic carbon stocks, for the Arctic in relation to changes in land conditions due to climate or use.

Thawing of the permafrost

The thawing of permafrost is a problem that may be connected to extreme weather patterns. The feedback to the hemispheric weather conditions should be observed by developing new observation networks.

The AACCA-C A report, which will be produced in 2016, will bring together the assessment of physical, biological, chemical and socioeconomic factors that impact the Arctic. The project should be followed by another project that will evaluate future developments and help plan mitigation and adaptation activities.

Although the Arctic may be considered as a test area in which to study global warming impacts as it is subjected to fewer stress factors than other regions, these stress factors have already had a strong impact on the region.

Marine environment and maritime activities

The ecosystem dynamics and effects of climate change on fish stocks are studied using, inter alia, EU and third country fisheries data on Arctic fish stocks. The JRC is highly involved with the EU Scientific, Technical and Economic Committee for Fisheries (STECF) through participation in its scientific Expert Working Groups. It also has close links to a global network of diverse experts through its role as the Secretariat of the STECF. Furthermore, the JRC provides advice directly to DG MARE on fisheries management regarding all of the world's oceans in which the EU has a fisheries interest, including the Arctic.

The JRC may further engage with the international scientific community, in particular the ICES, regarding the commercial exploitation of Arctic fish stocks. The JRC has wide-ranging expertise in the areas of fishery dynamics, fish stock assessment methods, assessment of fisheries management plans and management strategy evaluation. International scientific institutions such as the ICES would undoubtedly benefit through the application of such approaches to providing advice on sustainable fisheries management in the Arctic in an ecosystem context; advice that would undoubtedly be welcomed by the Arctic Council.

Arctic marine ecosystems are studied from the point of view of phytoplankton and primary production, particularly as they are impacted by climate changes, including sea ice retreat. Some of the marine environmental and blue growth aspects are also integrated in a dedicated Arctic portal in the European Atlas of the Seas (http://ec.europa.eu/maritimeaffairs/atlas/maritime_atlas) undertaken in partnership with DG MARE.

Maritime activities (including fishing, shipping, exploration and tourism) and their trends will need to be mapped for the responsible development and exploitation of the Arctic.

Tools that can monitor shipping traffic using data from ship reporting systems and satellites have been developed in order to study and anticipate the expected growth in maritime transport and trade through Arctic shipping. The JRC organised, chaired and presented ongoing work in this field in a special session of the ShipArc 2015 Conference on 25-27 August 2015 in Malmö, Sweden. These activities would be of interest to both the AMAP and the PAME working groups. As regards fisheries, the CAFF working group would also be interested. Observations of the positions of fishing vessels and how they change over time can help understand fleet dynamics and provide background information for fisheries management. Due to climate change, aquaculture production is expanding towards the north, as are many other human activities. A joint Central Arctic Ocean Ecosystem assessment by AMAP, CAFF and ICES is currently getting underway.

Following on from this and in the context of the Polar Code (which the US would like to see further developed under its Chairmanship of the Arctic Council), the JRC could also contribute to enhancing the safety of navigation in the Arctic through innovative technologies, near real-time sea ice information, risk assessment, vessel traffic management and service, and maritime situational awareness.

Freshwater management will become increasingly important; JRC activities on monitoring Arctic Ocean colour are a useful tool in this respect.

3.2.2 Climate drivers (short-lived climate pollutants)

Current atmospheric transport of pollution to the Arctic will be evaluated at the JRC. Outputs of the general circulation model will be statistically combined with atmospheric reanalyses in order to correlate weather patterns with the transport and deposition of black carbon and other pollutants to the Arctic, including estimations of uncertainties. The application of such methods will be extended to future decades in order to evaluate the effect of current and future pollutant emission policies on climate change and pollution in the Arctic.

Another study will be carried out based on the study on trends in global CH₄ 1980-2010⁸, which includes an analysis of methane in the Arctic. This study will examine other pressures on the Arctic environment that arise from climate impacts on the Arctic atmosphere, sea ice and ocean. By comparing processes in each of these compartments with the current trends in methane releases, it should be possible to infer both future trends in methane releases and the likelihood of potential tipping points.

The methane section of the AMAP short-lived climate pollutants report includes information on measurements of methane in Siberia. Japanese researchers have measured methane in the area. AMAP does not collect data - it utilises information that is readily available from NILU (Norwegian Institute for Air Research), the ICES and the National Snow & Ice Data Centre in the US.

The development of new satellite sensors is especially important for monitoring the Arctic, as existing passive (relying on sunlight) sensors operate at or outside their limits over the Arctic for much of the time. The joint Franco-German Merlin satellite, due to be launched in 2019, will carry a methane-sensing LIDAR that will be able to take measurements over the Arctic under both cloudy and variable sunlight conditions.

3.2.3 Pollutants, contaminants and health

The JRC undertakes a number of separate activities relevant to pollutants, contaminants and health that could be adapted to or applied in the Arctic:

- The JRC has developed low-cost passive samplers for persistent organic pollutants (POPs) and PAHs that are capable of operating effectively in the Arctic.

⁸ <http://www.nature.com/ngeo/journal/v6/n10/full/ngeo1955.html>

- The EDGARv4 global anthropogenic mercury emission inventory catalogues emissions of one of the historically critical contaminants in the Arctic region.
- Climate change represents a potentially serious driver of an expansion in vector-borne infectious diseases in the Arctic. A modelling approach is being developed to describe the impacts of climate change on the transmission dynamics and control of vector-borne infectious diseases, with a focus on the Arctic. The model simulates the potential consequences that a climatologically varying environment may have on the ecology and epidemiology of vector-borne diseases, which are climate-sensitive and show a tendency to expand towards the subarctic and arctic regions.
- The TM5-FASST modelling tool can be used to carry out integrated impact assessments of short-lived pollutants on air quality and climate.

The remote sensing of contaminants such as mercury and Persistent Organic Pollutants (POPs) would be of enormous benefit for the Arctic.

Health is discussed under the SDWG working group. Health problems caused by the West Nile virus, which is known to be an emerging disease, were discussed in a conference on contaminants in Finland, and unexpected effects not seen elsewhere have been observed in the Arctic.

AMAP is concerned with chemicals in the environment that may have an impact on human health, and the effects in the Arctic when the presence of such chemicals is outside the limits expected under normal screening and testing conditions. This research is carried out in support of, e.g., the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulation.

An important issue is that of how chemicals present in the environment interact with changing climatic conditions. Due to the specific environmental conditions, chemicals trapped in the environment for long periods of time may reach animals and the human population.

3.2.4 Cross-cutting issue: data management and integration

AMAP has a strong interest in data management and data access. There are currently many datasets on the Arctic that are not shared among scientists. Their use in the future will require the development of database search engines, metadata description rules and the accessibility of raw data. The JRC carried out two main activities that could be adapted to or applied within the context of the Arctic.

Firstly, the JRC has developed platforms and standards (such as those under the Infrastructure for Spatial Information in the European Community (INSPIRE) Directive) to manage heterogeneous geospatial datasets and make them available to users. The platforms developed and experience obtained by the JRC, e.g. with the Danube Reference Data Services Infrastructure, could be shared with the Arctic stakeholders.

Secondly, the JRC has developed the Blue Hub⁹ – an R&D platform for maritime surveillance and maritime situational awareness – to conduct research in data fusion and target tracking, knowledge discovery, tracks reconstruction and prediction, and anomaly detection. This could be used to enhance collaboration and information sharing with Arctic stakeholders, and undertake R&D to bring together all available data from Earth Observation, vessel tracking and other commercial services that is to date scattered, from which decision makers, operational authorities (e.g. regulation compliance, law enforcement, Search and Rescue, emergency response) and policy makers (e.g. Maritime Spatial Planning) could benefit.

⁹ <https://bluehub.jrc.ec.europa.eu>

4. Added value for the EU of enhanced JRC engagement with the Arctic Region

The Juncker priorities for making the EU "A Stronger Global Actor" and "A Union of Democratic Change" are both addressed by strengthening the links between EU institutions and the Arctic Council and contributing to the development of an EU policy on the Arctic. In this regard, the active involvement of the JRC with the Arctic Council and its subsidiary bodies, pending the granting of observer status in the Arctic Council to the EU, is key to promoting the EU's involvement and international cooperation in the Arctic.

Current JRC activities will be included in the Joint Communication on the Arctic, which is to be adopted in 2016. The JRC could better integrate and possibly expand its scientific activities on the Arctic that fall under the themes covered by the Arctic Council's subsidiary bodies. The involvement and contribution of the JRC in actions related to the Arctic issues described above provide the Commission and the EEAS with a tangible mechanism with which to contribute to the aims set by the Council conclusions on the EU policy on the Arctic, thereby supporting the EU's request to become an observer and strengthening its role as a global actor.

The JRC's contributions to the Arctic Council working groups and task forces strengthen the implementation of the Arctic Ocean policy of DG MARE and regional programmes of DG REGIO. The Northern Periphery and Arctic Programme's priority of sustainable development of natural and community resources is supported by JRC activities, while further benefits may be envisaged in the future in promoting innovation and competitiveness in remote and peripheral areas.

The JRC has recently signed a Memorandum of Understanding with the Norwegian Research Council in order to develop scientific cooperation with Norwegian research institutes. There is a strong interest from the Norwegian side in environmental and climate change research. Norway, as an Arctic country, and the JRC thus share a mutual interest in developing joint projects that focus on the Arctic. The Arctic is also one of the few remaining areas where engagement between Russian and western scientists continues to occur.

5. Options for a JRC Strategy for engagement in the Arctic region: the way forward

First of all, the JRC needs to balance the merits of devoting resources to supporting the Juncker priorities, "A Stronger Global Actor" and "A Union of Democratic Change", relative to the merits of the competing demands to support other priority areas.

A key point in the argument as to why the JRC must act rather than DGs REGIO, MARE or RTD, is that while the latter may direct funds to support the Arctic Region, the JRC is uniquely placed among Commission services as it is capable of directly engaging with the Arctic Council and its subsidiary bodies on the basis of its recognised scientific excellence. The strategy outlined below exploits this to the full and offers three scenarios according to the maximum level of effort the JRC can afford to put into its Arctic Strategy.

In all three scenarios, for those subjects presented that are of interest to AMAP or other Arctic Council WGs (CAFF, PAME, the SDWG), but not yet active collaborations, the JRC should participate in relevant open conferences and meetings to establish links & bona fide relationships with the working groups and expert groups as a first step to getting invited to participate in expert groups and observe in working groups on a regular basis. Where the JRC is participating in Horizon 2020 calls that are relevant to AMAP, AMAP would be happy to write a letter of recommendation.

Going beyond this basic recommendation to establish contacts with the subsidiary bodies of the Arctic Council, three levels of ambition for the JRC can be identified:

Business as usual: the existing activities continue independently and make individual contacts with the relevant subsidiary bodies identified above. The effort dedicated to engagement with the Arctic Region is decided within the individual activities.

Soft development: Increased coordination. Build a JRC "Connected" group space and subsequently form a JRC Arctic Task Force and/or JRC Arctic Cluster with an objective of exploring synergies between the existing activities, e.g. all those supporting a particular working group or task force, with a view to establishing a JRC cross-institute Arctic Project in 2017. This will require some coordination between institutes and recognition of the need to enhance the visibility of the combined activities, but would allow us to discuss and prioritise the evolution of the JRC Arctic Strategy.

Ambitious development: The "Soft development" option plus the development of new demand-led activities in areas of JRC excellence where the subsidiary bodies of the Arctic Council have a need, or based on new priorities identified with the EEAS, e.g. applying experience gained through the Danube Reference Data Services infrastructure project to Arctic issues. This option requires a JRC-level decision to engage actively with the Arctic Region.

6. Conclusions

1. The Arctic is experiencing unprecedented and disproportionately high rates of environmental change due to the effects of climate change. These changing conditions are making it easier to exploit the natural wealth of the Arctic (minerals, fisheries, land resources), while threatening the existence of Arctic ecosystems and the indigenous population that rely on them.
2. The EU institutions have recognised these threats to and opportunities for the Arctic. The Commission (with input from the JRC), together with the EEAS, and supported strongly by both the Council and the Parliament, are due to propose an EU Arctic policy by December 2015.
3. The Arctic Council has not yet pronounced on the EU's longstanding application for observer status and will not do so before 2017. By virtue of its scientific excellence, the JRC's engagement with the Arctic Council and its subsidiary bodies is therefore a critical means by which the EU can directly engage the Arctic Council, pending the granting of official observer status.
4. The JRC has already been working with the subsidiary bodies of the Arctic Council in the areas of atmospheric monitoring and the modelling of black carbon, the Arctic region forestry and biomass, sustainable development, climate information, modelling and analysis, and the JRC's Soil Atlas of the Northern Circumpolar Region.
5. The JRC has extensive expertise in areas related to fisheries and the provision of fisheries management advice. Further JRC engagement with international scientific organisations such as the ICES and the subsidiary bodies of the Arctic Council would undoubtedly enhance advice on sustainable fisheries management in the Arctic in an ecosystem context.
6. A more systematic approach to the JRC's future engagement with the Arctic Council in support of the future EU Arctic policy goals is consistent with the mission of the JRC.
7. A JRC-level decision is needed as to which of three levels of ambition in engagement with the Arctic Council it must follow. The "Business as usual" choice can be accommodated within existing projects; the "Soft development" option will require enhanced coordination between institutes; and the "Ambitious development" option would lead to the development of new demand-led activities in areas of JRC expertise where the subsidiary bodies of the Arctic Council have a need, e.g. applying experience gained within the Danube Reference Data Services infrastructure project to the Arctic.
8. The "Business as usual" and "Soft development" options have minor resource implications. As the "Ambitious development" option would have larger resource implications, the relative merit of the EEAS's request for the JRC to engage with the bodies of the Arctic Council needs to be considered in relation to other competing resource demands.

List of abbreviations and definitions

AACA-C	Adaptation Actions in a Changing Arctic phase C
ACAP	Arctic Contaminants Action Programme
CAFF	Conservation of Arctic Flora and Fauna
DG ENV	Directorate General for the Environment
DG MARE	Directorate General for Maritime Affairs and Fisheries
DG REGIO	Directorate General for Regional Policy
DG RTD	Directorate General for Research and Innovation
EEAS	European External Action Service
EDGAR	Emissions Database for Global Atmospheric Research
EPB	European Polar Board
EPPR	Emergency Preparedness and Response
ERDF	European Regional Development Fund
EU	European Union
FP7	Framework Programme Seven
H2020	Horizon 2020
ICE-ARC	Ice, Climate, Economics - Arctic Research on Change
INSPIRE	Infrastructure for Spatial Information in the European Community
ICES	International Council for the Exploration of the Sea
IMO	International Maritime Organization
JRC	Joint Research Centre
NILU	Norwegian Institute for Air Research
PAH	Poly-Aromatic Hydrocarbons
PAME	Protection of the Arctic Marine Environment
POP	Persistent Organic Pollutant
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RSP	Regional Seas Programme
SDWG	Sustainable Development Working group
SOLAS	Convention for the Safety of Life at Sea
STEF	Scientific Technical and Economic Committee on Fisheries
TFBCM	Task Force for action on Black Carbon and Methane
USA	United States of America

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JRC Mission

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